Science Advances
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Supplementary Materials for

Understanding deep ultraviolet surface enhanced Raman scattering: case study of Pt nanoparticles with modified Work Functions

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This PDF file includes:
Figs. S1 to S7

Extended lists of acknowledgments
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Commentato [MOU1]: Qui mi è piaciuto così

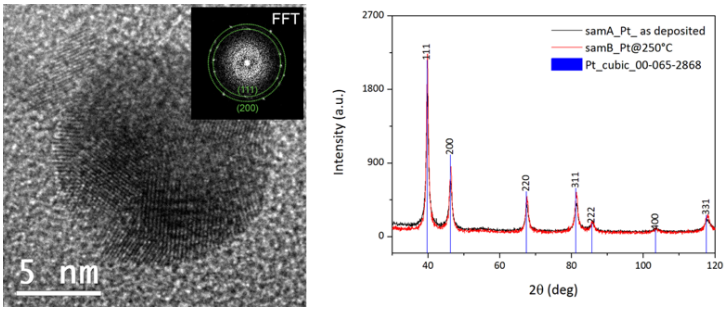

Fig. S1.

(Left side) HRTEM of a Pt NP, (right side) XRD of Pt NPs, showing a cubic fcc structure of the metal NPs.

Commentato [MOU2]: Aggiunta la figura che Moreno, avevi omesso, sempre per professionalità

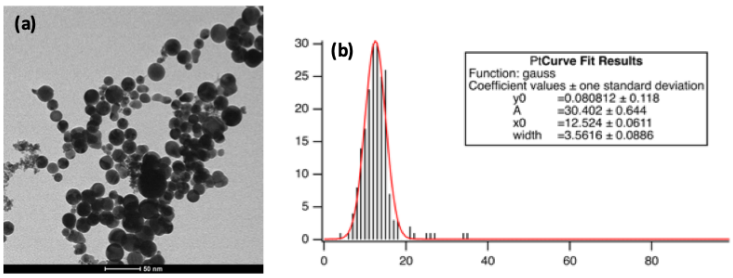

Fig. S2.

(A)TEM image of the $PtNP_{UPW}$ obtained in ultrapure water and quartz glassware; (B) size distribution and gaussian fitting.

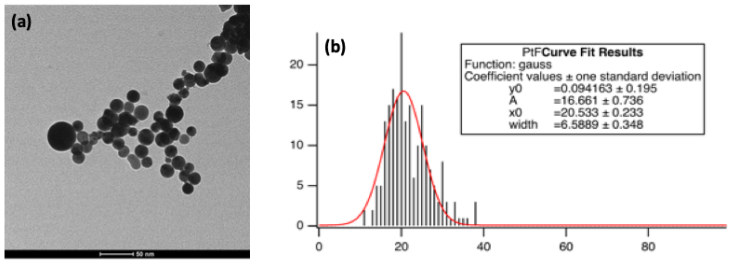

Fig. S3.

(A) TEM image of the $PtNP_F$ obtained by processing $PtNP_{UPW}$ with HF; (B) size distribution with gaussian fitting.

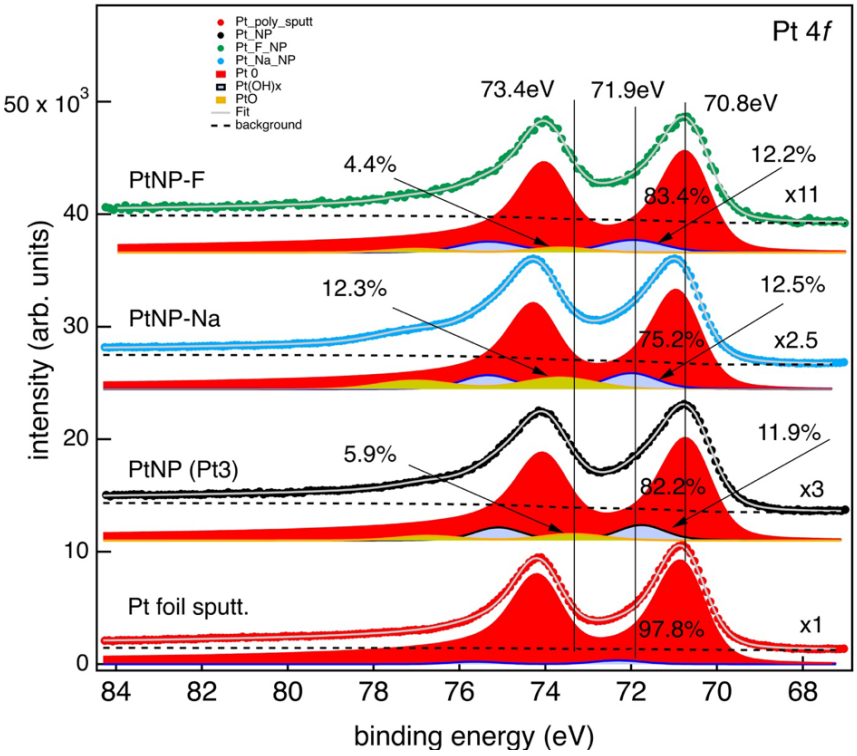

Fig. S4.

XPS, Pt4f core levels. Colours code: black: Pt-Na (WF 3.7 eV), blue: Pt (WF 5 eV), green: Pt-F (WF 5.8 eV), red: sputtered polycrystalline Pt (WF 4.7 eV, for reference). The chemical state of the as deposited NPs, and NPs after annealing in UHV at 250°C are analysed via XPS. Data indicate that a significant amount of platinum of the as deposited NPs is in metallic state, as shown both by the Pt 4*f* XPS core level (red component, Pt $4f_{7/2}$: 70.8eV, 82.2%) and by the presence of a metallic Fermi level in the valence band spectrum (Fig. 7, inset main text). XPS shows the presence of platinum in different oxidation states, which are compatible with Pt-$(OH)_x$ (blue component, Pt $4f_{7/2}$: 71.6eV-71.9eV, 11.9%) and Pt^{2+} (yellow component, Pt $4f_{7/2}$ at 73.4eV, 5.9%) (40-43). The presence of a stable platinum oxide explains the negative charging of the NPs evident in Z-Potentials performed in Na contaminated PtNPs in double distilled water of about (-30 ± 5.93) mV, suggesting the presence (44, 45) of species Pt-O like at the surface of the particles and the capture of oxides/hydroxides by the Pt surface, which explains the long-term stability of Pt NPs suspensions in water.

Commentato [MOU3]: Aggiunta figura e didascalia di Cinzia, professionale perché abbiamo ossidi non passivanti e relative references che sono nel main text

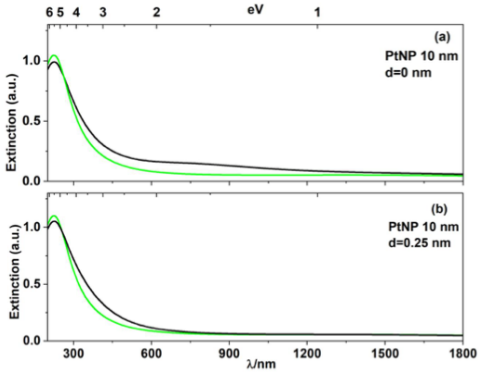

Fig. S5.

(A) Comparison of the extinction spectrum of a dimer of PtNP with particles of 10 nm size at the distance d = 0 nm (black line) and the spectrum of two isolated PtNP (green line) of 10 nm. (B) The same comparison, but with the distance of the particles in the dimer at d = 0.25 nm.

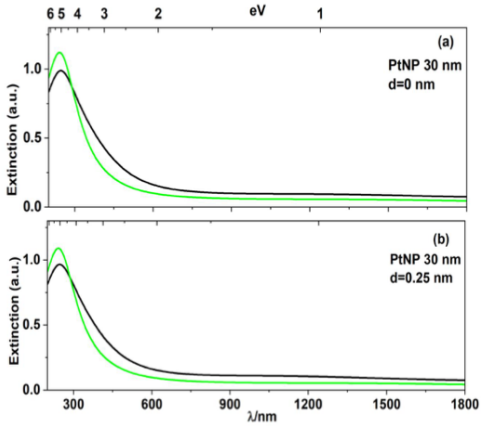

Fig. S6.
(A) Comparison of the extinction spectrum of a dimer of PtNP with particles of 30 nm size at the distance d = 0 nm (black line) and the spectrum of two isolated PtNP (green line) of 30 nm. (B) The same comparison, but with the distance of the particles in the dimer at d = 0.25 nm.

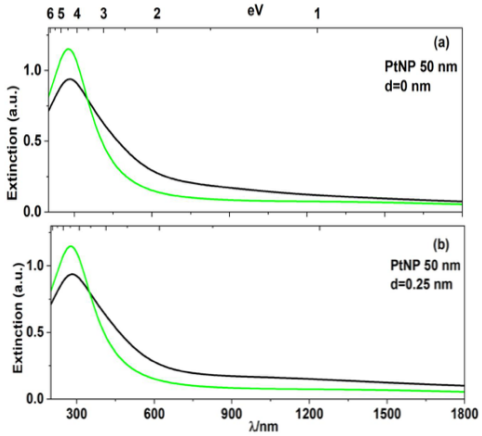

Fig. S7.
(A) Comparison of the extinction spectrum of a dimer of PtNP with particles of 50 nm size at the distance d = 0 nm (black line) and the spectrum of two isolated PtNP (green line) of 50 nm. (B) The same comparison, but with the distance of the particles in the dimer at d = 0.25 nm.